

CLAIMS

- 1 1. Cleaning plate for cleaning the ion guide electrodes of a mass spectrometer
2 having a vacuum lock for the introduction of a sample support plate and a
3 desorption ion source in which the ion guides reside adjacent to a sample
4 support plate that has been introduced through the vacuum lock, the cleaning
5 plate comprising:
6 an outer contour sufficiently similar to that of the sample support plate that
7 the cleaning plate can be introduced into the vacuum system of the mass
8 spectrometer via the vacuum lock; and
9 a cleaning device that resides adjacent to the ion guide electrodes when
10 the cleaning plate is introduced to the mass spectrometer and with which the ion
11 guide electrodes may be cleaned.
- 1 2. Cleaning plate according to Claim 1, wherein the cleaning device comprises one
2 or more cleaning scrubbers.
- 1 3. Cleaning plate according to Claim 2, wherein the cleaning scrubbers each have a
2 cover made of fabric, felt, leather, steel wool, rubber, sponge or brush hairs.
- 1 4. Cleaning plate according to Claim 3, wherein the material of the cover contains
2 emery particles.
- 1 5. Cleaning plate according to Claim 2, wherein the cleaning scrubbers are recess
2 mounted in the cleaning plate and the cleaning plate incorporates
3 electromechanical devices with which the cleaning scrubbers can be moved out
4 of their recesses.
- 1 6. Cleaning plate according to Claim 5, further comprising light sensitive elements
2 that can respond to light signals to initiate the movement of the cleaning
3 scrubbers.

- 1 7. Cleaning plate according to Claim 1, wherein the cleaning device comprises at
2 least one spray nozzle which is connected to a fluid volume in the cleaning plate.
- 1 8. Cleaning plate according to Claim 7, wherein each spray nozzle has an inside
2 diameter of between 50 and 300 micrometers.
- 1 9. Cleaning plate according to Claim 1, further comprising an identification element
2 that identifies it as a cleaning plate.
- 1 10. Cleaning plate according to Claim 9, wherein the identification element
2 comprises a machine readable code.
- 1 11. Cleaning plate according to Claim 10, wherein the machine readable code is
2 coded in a transponder attached to the cleaning plate.
- 1 12. Cleaning plate according to Claim 10, wherein the machine readable code
2 comprises a barcode attached to the cleaning plate.
- 1 13. Cleaning plate according to Claim 1, wherein the cleaning plate incorporates one
2 or more mirrors that allow optical checking of the cleaning success.
- 1 14. Method for cleaning an ion guide electrode in an ion source chamber of a mass
2 spectrometer with a sample support vacuum lock, the method comprising:
3 (a) introducing a cleaning plate with one or more spray nozzles connected
4 to cleaning fluid into the vacuum lock;
5 (b) venting the ion source chamber of the mass spectrometer without
6 evacuating the sample support lock;
7 (c) moving the cleaning plate into the vented ion source chamber and
8 positioning the cleaning plate in front of the ion guide electrode;
9 (d) evacuating the ion source chamber whereby the cleaning fluid begins
10 to spray out of the spray nozzles; and

- 11 (e) moving the cleaning plate in such a way that fluid from the spray nozzles is
12 incident upon predetermined areas of the ion guide electrode.
- 1 15. Method according to Claim 14, wherein moving the cleaning plate comprises
2 moving the cleaning plate with a movement mechanism used for movement of a
3 typical sample support plate used with the spectrometer.
- 1 16. Method according to Claim 14, wherein the cleaning plate is stored together with
2 normal sample support plates and the method further comprises automatically
3 feeding the cleaning plate to the mass spectrometer by means of a feed robot.
- 1 17. Method according to Claim 14 wherein the cleaning plate includes mirrors
2 attached to its surface, and wherein the method further comprises observing
3 cleaning progress optically using the mirrors.
- 1 18. Method for cleaning an ion guide electrode in a desorption ion source of a mass
2 spectrometer with a sample support vacuum lock, the method comprising:
3 (a) introducing a cleaning plate with one or more cleaning scrubbers into a
4 vacuum chamber of the ion source via the vacuum lock;
5 (b) positioning the cleaning plate in front of the ion guide electrode;
6 (c) moving a cleaning scrubber out of the cleaning plate in such a way that
7 a scrubber surface presses against the ion guide electrode; and
8 (d) moving the cleaning scrubber in such a way that material adhering to
9 the ion guide electrode is removed by the cleaning scrubber.
- 1 19. Method according to Claim 18 wherein moving the cleaning plate comprises
2 moving the cleaning plate with a movement mechanism used for movement of a
3 typical sample support plate used with the spectrometer.
- 1 20. Method according to Claim 18 wherein at least one of the cleaning scrubbers has
2 a soft cover material that contacts the electrode.

- 1 21. Method according to Claim 20 wherein the soft cover of at least one of the
2 cleaning scrubbers is dampened with a high-boiling point liquid before the
3 cleaning plate is introduced via the lock.
- 1 22. Method according to Claim 21, wherein after cleaning with a dampened cleaning
2 scrubber polishing is carried out with a dry cleaning scrubber.
- 1 23. Method according to Claim 18, wherein the cleaning plate comprises a light
2 sensitive element connected to a controller for the scrubbers, and wherein a light
3 signal is directed at the light sensitive element to initiate movement of one of the
4 cleaning scrubbers.
- 1 24. Method according to Claim 18, wherein the cleaning scrubbers are automatically
2 retracted again after a preset time.
- 1 25. Method according to Claim 18, wherein the cleaning plate comprises a machine
2 readable identification element that may be read in a reading station of the mass
3 spectrometer, and wherein reading of the identification element may be used to
4 initiate a control program for the cleaning.
- 1 26. Method according to Claim 18, wherein the cleaning plate is stored together with
2 normal sample support plates and the method further comprises automatically
3 feeding the cleaning plate to the mass spectrometer by means of a feed robot.
- 1 27. Method according to Claim 18 wherein the cleaning plate includes mirrors
2 attached to its surface, and wherein the method further comprises observing
3 cleaning progress optically using the mirrors.
- 1 28. Method according to Claim 27, wherein the optical observing is done via a video
2 system of the mass spectrometer.